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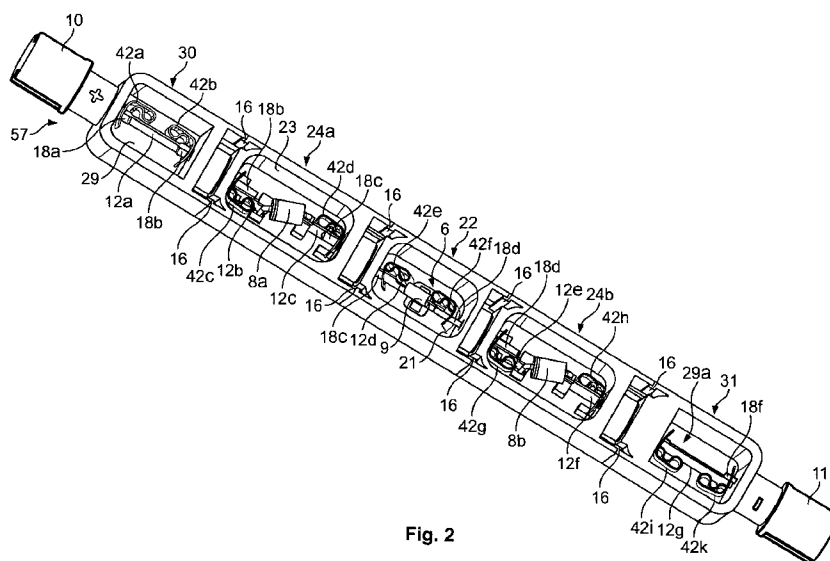


Fig. 2

(57) Abstract: A kit for an electrical connection system for photovoltaic solar installations, which comprise a plurality of solar cells each with their own electrical connection, comprises a number of modules which comprise a plurality of different module types, in each of which different components of the connection system are accommodated. The kit comprises at least one module type, which is provided with a connecting device for connecting the external electrical connection of one of the solar cells. A plurality of the modules may be connected together in a selectable manner.

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ELECTRICAL CONNECTION SYSTEM FOR PHOTOVOLTAIC SOLAR INSTALLATIONS

The invention relates to an electrical connection system for photovoltaic solar installations and module parts of such a connection system.

5 Solar installations typically comprise a plurality of solar cells, which are connected together electrically in order to increase the output power of the solar installation. However, shaded solar cells absorb some of the current produced by sunlit solar cells and thereby reduce the power output by the solar installation. To prevent this, diodes are connected between the individual solar cells in such a way that the solar cells
10 can output current but not absorb current. These diodes are conventionally housed together with the connecting leads leading to the individual solar cells in a "connection box". To protect the diodes and connections from negative environmental influences, such as for example dust and moisture, the connection box is sealed, such that a predetermined ingress protection (IP) rating is achieved. The flowing currents of up to 10
15 Amperes heat the diodes to up to 200 °C when in operation. Due to sealing of the connection box, the heat can be only poorly dissipated outwards and uncontrollable thermal superposition and thermal transfer between the diodes may arise inside the connection box. This has a negative effect on the power of the solar installation. It is also necessary to produce separate connection boxes for different solar installations with a
20 corresponding number of connections and diodes depending on the number of solar cells used.

An object of the present invention is accordingly to provide an electrical connection system for photovoltaic solar installations which displays a desired IP

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protection rating, reliably prevents thermal transfer and superposition between the diodes and may be flexibly adapted for solar installations with different numbers of solar cells.

This object is achieved by a kit for an electrical connection system for photovoltaic solar installations according to claim 1 and modules according to claim 16
5 constituting parts of such a kit.

A kit according to the invention for an electrical connection system for photovoltaic solar installations, which comprise a plurality of solar cells each with their own electrical connection, comprises a number of modules which comprise a plurality of different module types, in each of which different components of the connecting system
10 are accommodated. The kit comprises at least one module type, which is provided with a connecting device for connecting the external electrical connection of a solar cell. A plurality of the modules may be connected together in a selectable manner.

A selectable component of the connection system is included with a module constituting part of a kit comprising a plurality of such modules and the module is
15 connectable to further modules of the kit.

With such a modular kit, an electrical connection system may be individually assembled according to particular requirements, in particular in accordance with the number of solar cells used in the solar installation. Because the different components of the connection system are accommodated in each case in a separate module, uncontrolled
20 thermal superposition and thermal transfer between the components is reliably avoided. Since each of the modules is in itself smaller than a conventional connection box, it may be more readily sealed, in order to achieve the desired IP protection rating.

In one embodiment, for connecting the electrical connection of a solar cell the connecting device comprises a clamping device for clamping the electrical connection.

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With such a clamping device the electrical connection may be secured simply and reliably. In a further embodiment, the clamping device takes the form of an "omega clip", which allows particularly simple and reliable securing of the connection.

In a further embodiment, the kit comprises a type of module which is designed for
5 connection of a component selected from a diode, a temperature sensor and a theft sensor. Because each such module contains at most one diode, uncontrolled thermal transfer between the diodes is prevented. Dissipation of heat may thus be controlled and the module designed accordingly.

The temperature of the solar cells may be monitored using a module provided with
10 a temperature sensor. To this end, the electrical connection system is fastened directly to the solar cells. If a temperature sensor is included in a module together with a diode, the operating temperature of the diode may also be monitored. Using a theft sensor, which for example detects unusual vibration of the solar module or a sudden interruption of the electric circuit, an attempt to steal solar modules may be identified early, such that a
15 corresponding alarm may be triggered.

In a further embodiment, the kit comprises a type of module which is provided with a power connection or a data connection. Current generated by the solar cells may be carried from the connection system to a consumer unit or a storage device through the power connection. Alternatively, current may be supplied by a further connection system,
20 in order to increase the output of the overall system. Data produced by the temperature sensor or the theft sensor may be transmitted through a data connection for further evaluation and processing. The data connection may be an analogue or a digital data connection; in particular it may be an RJ45 connection.

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In one embodiment, the kit comprises a type of module which is provided with at least one conductor bar. Using the conductor bar, the current may be conducted through the module with particularly low losses. A module with such a conductor bar is also simple to produce. Such a conductor bar may also be particularly simply designed for
5 connection of the external electrical connection of one of the solar cells. A diode may be connected between two conductor bars. Thus, a diode may be particularly simply and effectively connected.

In a further embodiment, the kit comprises a type of module which is provided with cooling ribs. The heat arising in the module through operation of a component of the
10 connection system, for example a diode, may be effectively dissipated through such cooling ribs. In a particular embodiment, the cooling ribs are of dovetailed construction, such that two modules may be connected together by inserting the cooling ribs inside one another. In this way, different modules may be assembled particularly simply into a two- or three-dimensional unit.

15 In a further embodiment, the kit comprises a type of module which is filled at least partly with a casting compound. A thermally conductive casting compound may dissipate the heat generated by the component in the module to the outside.

A suitable casting compound may also provide protection for the components present in the module from harmful influences, such as for example moisture or dust.

20 In one embodiment, the modules each comprise at least one latching connector, for connecting adjacent modules together mechanically. Such a latching connector is simple to produce and makes it possible to connect adjacent modules together rapidly and reliably.

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In a further embodiment, at least some of the types of modules of the kit, in each case, comprise at least one electrical connector, for connecting adjacent modules together electrically. In this way, the components present in the modules may be simply and reliably connected together electrically.

- 5 In a further embodiment, at least some of types of modules, in each case, comprise at least one O-ring, in order to seal the electrical connector. In this way, the penetration of moisture into the electrical connection may be reliably and effectively prevented.

- In a further embodiment, at least some of the types of modules may be closed in a leak proof manner. In this way, the components present in the respective module type
10 may be reliably protected from moisture and other negative environmental influences, such as, for example, dust.

- In one embodiment, the modules are produced, at least in part, using an injection moulding method. An injection moulding method enables simple and inexpensive production of the modules. In a further embodiment, the modules have a uniform outer
15 structure, such that they may be produced inexpensively with a single injection mould.

 In a further embodiment, the modules are provided at the end walls, at the side walls and/or on the top or bottom with connecting elements, such that the modules may be connected together in two or three dimensions.

- The invention is explained in greater detail below with reference to the exemplary
20 embodiments illustrated in Figures 1 to 9.

 Figure 1 is a plan view of an electrical connection system according to the invention.

 Figure 2 is a perspective view from above of the electrical connection system from Figure 1.

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Figure 3 is a perspective view from above of a diode module for an electrical connection system according to the invention.

Figure 4 is a perspective view from above of a module for an electrical connection system according to the invention, which is arranged for accommodation of a sensor and a
5 data connection.

Figure 5 is a perspective view from above of an end module with a power connection for an electrical connection system according to the invention.

Figure 6 is a perspective view from above of a connection module for an electrical connection system according to the invention with a connecting device for connecting a
10 solar cell.

Figure 7 is a perspective view from above of a blank of a module for an electrical connection system according to the invention with a divided-off area.

Figure 8 is a perspective view from above of a cooling module for an electrical connection system according to the invention.

Figure 9 shows two connected-together modules for an electrical connection system according to the invention, which are closed from above with a cover.

Detailed description of the drawings

Figure 1 shows a plan view of an electrical connection system 2 according to the invention. The connection system 2 shown in Figure 1 comprises five modules 30, 24a, 20 22, 24b, 31, which are arranged in a row from left to right and are each connected together in pairs at their end walls. The modules 30, 24a, 22, 24b, 31 have not as yet been closed by a cover, so as to allow a view into their inside 29, 23a, 21, 23b, 29a.

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The first, far left end module 30 comprises at its end wall 57 a first power connection 10, which serves as a power output connection, for carrying the current generated by the solar cell (not shown) to a consumer unit or a current storage device. The first power connection 10 shown in Figure 1 takes the form of a round bayonet connection. Alternatively, a screw or plug-in connection may also be provided. A first electrically conductive pin 18a leads from the first power connection 10 into the internal space 29 of the end module 30 and is there connected by a first cage clamp spring 42a to the left-hand end of a first conductor bar 12a, which extends from the end wall 57 of the internal space 29 to the right-hand end wall of the end module 30. There, the right-hand end of the first conductor bar 12a is connected by a second cage clamp spring 42b to a second electrically conductive pin 18b, which leads through the right-hand end wall of the end module 30 into a first diode module 24a adjacent and to the right. The first conductor bar 12a takes the form of an elongate metal plate and is arranged with its broad side vertical in the internal space 29 of the end module 30.

In the first diode module 24a, the second electrically conductive pin 18b is connected via a third cage clamp spring 42c to the left-hand end of a second conductor bar 12b. To the right-hand end of the second conductor bar 12b there is connected the left-hand terminal of a first diode 8a. The right-hand terminal of the first diode 8a is connected to the left-hand end of a third conductor bar 12c on the right-hand side of the internal space 23 of the first diode module 24a. The right-hand end of the third conductor bar 12c is in turn connected by a fourth cage clamp spring 42d to a third electrically conductive pin 18c, which leads through the right-hand end wall of the first diode module 24a into the connection module 22 adjacent and to the right. Because the diode module 24a contains only one diode 8a, uncontrolled thermal transfer between different diodes is

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reliably avoided. In order to better dissipate the heat generated by the first diode 8a, the internal space 23 of the diode module 24a may be filled with a thermally conductive casting compound, and/or the walls of the diode module 24a may be provided with cooling ribs 14 (see below, Figure 8).

5 In the connection module 22 the third electrically conductive pin 18c is connected by a fifth cage clamp spring 42e to the left-hand end of a fourth conductor bar 12d, which leads from left to right through the internal space 21 of the module 22 and is connected at its right-hand end on the right-hand side of the internal space 21 via a sixth cage clamp spring 42f to a fourth electrically conductive pin 18d, which leads into the diode module
10 24 adjacent and to the right. The middle area of the fourth conductor bar 12d is constructed as a connecting device 6 for connection of an electrical connection of a solar cell (not shown). The solar cell connection, which takes the form, for example, of a flexible flat cable of aluminium, is clamped to the fourth conductor bar 12d by a clamping device, which takes the form, for example, of an "omega spring" 9. The flexible flat cable
15 of the solar cell is introduced via an opening, not visible in Figure 1, in the base of the module 22 into the internal space 21 thereof and placed around the middle area of the fourth conductor bar 12d. Then the flexible flat cable is clamped on the middle area of the fourth conductor bar 12d by pushing on the omega spring 9. Construction of the connecting device 6 as a clamping device for a flexible flat cable is only an example. The
20 connecting device 6 may also take any other form, for example it may take the form of a plug-in or screw connection.

The structure of the second diode module 24b, which is arranged to the right of the connection module 22, corresponds to the structure of the first diode module 24a, which is arranged to the left of the connection module 22. In the second diode module

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24b the fourth electrically conductive pin 18d is connected via a seventh cage clamp spring 42g to the left-hand end of a fifth conductor bar 12e. To the right-hand end of the fifth conductor bar 12e there is connected the left-hand terminal of a second diode 8b.

The right-hand terminal of the second diode 8b is connected to the left-hand end of a sixth

5 conductor bar 12f, which is arranged on the right-hand side of the internal space 23b of the second diode module 24b. The right-hand end of the sixth conductor bar 12f is in turn connected by an eighth cage clamp spring 42h to a fifth electrically conductive pin 18e, which leads through the right-hand end wall of the second diode module 24b into the end module 31 adjacent and to the right.

10 The structure of the right-hand end module 31 is a mirror image of the structure of the left-hand end module 30. The fifth electrically conductive pin 18e introduced through the left-hand end wall 56 of the end module 31 is connected electrically via a ninth cage clamp spring 42i to the left-hand end of a seventh conductor bar 12g. The seventh conductor bar 12g leads through the internal space 29a of the end module 31 and is
15 connected at its right-hand end via a tenth cage clamp spring 42k to a sixth electrically conductive pin 18f. The sixth electrically conductive pin 18f is guided through the right-hand end wall 57 of the end module 31 and connects the seventh conductor bar 12g electrically to a second power connection 11. The second power connection 11 of the right-hand end module 31 serves as a power input connection, for coupling on a further
20 connection system 2 via a cable, not shown, such that two or more electrical connection systems 2 are operated in series with the associated solar cells, in order to increase the output voltage of the system. If no provision is made for connecting a further connection system 2, the second connection is closed with an insulating plug or an end module is

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used which does not have a second power connection 11 but rather accommodates and insulates the fifth electrically conductive pin 18e of the adjacent module.

At the interfaces between the modules 30, 24a, 22, 24b, 31 the latching connectors 16 are visible, which connect the modules together mechanically at their end faces and
5 take the form, for example, of latching or plug-in connectors.

Figure 2 shows the connection system 2 of Figure 1 in a perspective view. The elements already illustrated in Figure 1 and discussed in connection with Figure 1 are provided with the same reference signs and are not discussed again.

Figure 3 shows the perspective view of a diode module 24 from above. In this
10 view too, no cover is shown, so as to allow a view into the inside 23 of the diode module 24. The diode module 24 is cuboid in form with an approximately square cross-section. The diode module 24 is approximately twice as long as it is wide or high. Such a module has, for example, a width of 25 mm, a height of 25 mm and a length of 50 mm. At its left-hand end wall 56 the diode module 24 comprises outwardly projecting, vertical side wall
15 portions 52 and therebetween a set-back area 54, in which there are provided two latching arms 16a each with an outwardly extending latching hook and a round connecting piece 19a for receiving an electrical contact pin 18. Inside the diode module 24 there is formed an internal space 23 for accommodating components of the connection system 2, such as for example a diode 8. The terminals of the diode 8 are each fastened to the ends of a
20 second and third conductor bar 12b, 12c, these each leading to the left-hand or right-hand end wall 56, 57 of the diode module 24. At the left-hand end of the second conductor bar 12b there is located a left-hand third cage clamp spring 42c, for connecting the second conductor bar 12b to a pin, inserted through the connecting piece 19a in the left-hand end wall 56, of an adjacent module, not shown. The third conductor bar 12c is connected at its

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right-hand end by a right-hand fourth cage clamp spring 42d to a third electrically
conductive pin 18c, which leads through the right-hand end wall 57 of the diode module
24 to the outside. In the exemplary embodiment shown, the third pin 18c is round, taking
the form for example of a knurled contact pin, but the pin may also be polygonal, taking
5 the form for example of a square, hexagonal or octagonal pin.

On the right-hand end wall 57 of the diode module 24, a round connecting piece
19b is formed around the third pin 18c guided outwards through the end wall 57, which
connecting piece 19b may be fitted into the connecting piece 19a of an adjacent module,
not shown. Around the circumference of the connecting piece 19b there is arranged an O-
10 ring 20, for sealing the connection between the connecting piece 19a and the connecting
piece 19b of an adjacent module.

On both sides of the right-hand end wall 57 of the diode module 24, at the outside,
there are formed two projections 17, which extend over the entire height of the end wall
57 from top to bottom. The latching hooks of the latching arms 16a of an adjacent module
15 may engage these projections 17, in order to connect the modules together. In an
alternative exemplary embodiment, not shown, the projections 17 are not formed over the
entire height of the end wall 57 of the diode module 24, but rather only at the level of the
latching arms 16a.

Figure 4 shows a sensor module 26 for a sensor. In this view too, no cover is
20 shown, so as to allow a view into the internal space 25 of the sensor module 26. The outer
structure of the sensor module 26 corresponds to the diode module 24 shown in Figure 3.
In the internal space 25 of the sensor module 26 there is provided a receiving box 70 for
receiving a sensor, for example a temperature or theft sensor. The inside of the receiving
box 70 is accessible from the outside via an opening 72 in the side wall 63 of the sensor

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module 26. A data connection may, for example, be introduced into the opening 72, in order to output to the outside the data generated by a sensor introduced into the receiving box 70 and/or to control the sensor by signals supplied from outside. In the exemplary embodiment shown in Figure 4, no conductor bar is shown in the internal space 25 of the sensor module 26. Depending on the type of sensor introduced into the receiving box 70, a conductor bar 12 is guided around the receiving box 70 in the inside 25 of the sensor module 26, if the sensor does not need any contact with the conductor bar 12, for example if the sensor is provided for measuring the temperature of the solar cells. The conductor bar 12 is guided through the receiving box 70, if the sensor is provided, for example, for measuring the current flowing through the conductor bar 12. As in the diode module 24 shown in Figure 3, the conductor bar is connected via cage clamp springs, not shown, to electrically conductive pins, not shown, which are guided outwards through openings 50, 51 in the end walls 56, 57 of the sensor module 26.

Figure 5 shows a perspective view of an end module 31 with a second power connection 11. Here too, the cover has been removed, to allow a view of the inside 29a of the right-hand end module 31. The outer dimensions and the structure of the left-hand end wall 56 correspond to the diode module 24 shown in Figure 3. In the exemplary embodiment shown in Figure 5 of the end module 31, the corners of the right-hand end wall 57 are rounded, but this is only an exemplary configuration and is not absolutely necessary. In the inside 29a of the end module 31, a seventh conductor bar 12g extends from left to right. At the left-hand end of the seventh conductor bar 12g there is provided a left-hand ninth cage clamp spring 42i, for electrically connecting the first conductor bar 12a to a pin, not shown in Figure 5 and inserted through the connecting piece 19a and the opening 19c in the left-hand end wall 56, of an adjacent module not shown in Figure 5. At

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the right-hand end of the seventh conductor bar 12g there is provided a right-hand tenth cage clamp spring 42k, which connects the seventh conductor bar 12g to a sixth electrically conductive pin 18f, which is guided outwards through the right-hand end wall 57 and connects the seventh conductor bar 12g electrically to the second power
5 connection 11, which is mounted on the outside of the right-hand end wall 57. The second power connection 11 shown in Figure 5 is a round bayonet connection, but a screw or plug-in connection may alternatively be used. The second power connection 11 may take the form of a plug ("male") or socket ("female"). The second power connection 11 serves either as a power output connection for the purpose of carrying current generated by the
10 solar cells, not shown, to a consumer unit or a current storage device, or as a power input connection for the purpose of coupling on a further connection system 2 via a cable, not shown. Thus, a plurality of electrical connection systems 2 may be connected in series, in order to increase the output voltage of the overall system.

Figure 6 shows a perspective view of a connection module 22 for connection of a
15 solar cell, not shown. The outer dimensions, and the structure of the left-hand end wall 56 and the right-hand end wall 57, correspond to those of the diode module 24 shown in Figure 3, wherein in the perspective shown in Figure 6 the latching arms 16a are invisible but nevertheless present at the left-hand end wall 56 of the connection module 22. The connecting piece 19b on the right-hand end wall 57 of the connection module 22 has not
20 yet been provided with an o-ring 20. Instead, a receiving groove 20a is visible, which is formed in the circumference of the connecting piece 19b for receiving such an o-ring 20.

In the internal space 21 of the connection module 22 a conductor bar 12 extends from left to right. At its left-hand end, the conductor bar 12 is provided with a left-hand first cage clamp spring 42a, for connecting the conductor bar 12 to an electrically

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conductive pin 18, inserted through the connecting piece 19a on the left-hand end wall 56 of the module 22, of an adjacent module, not shown in Figure 6. At its right-hand end, the conductor bar 12 is provided with a right-hand second cage clamp spring 42b, which connects the conductor bar 12 to an electrically conductive pin 18, which is guided
5 outwards through the right-hand end wall 57 and the connecting piece 19b mounted on the outside of this end wall 57, in order to connect the module 22 electrically to an adjacent module. The middle area of the conductor bar 12 takes the form of a connecting device 6 for connection of a solar cell, not shown in Figure 6. In the exemplary embodiment shown in Figure 6, this connecting device 6 takes the form of a clamping
10 device with an "omega spring" 9. The connecting cable of the solar cell, which takes the form of a flexible flat cable, is introduced through an opening not visible in Figure 6 in the base of the connection module 22 into the internal space 21 thereof and placed around the conductor bar 12. Then the omega spring 9 is pushed from above onto the conductor bar 12, in order to clamp the flexible flat cable on the conductor bar 12. Such a clamping
15 device provides a connection which is simple to produce but nevertheless secure between the connecting cable and the conductor bar 12. Construction of the connecting device 6 as a clamping device for a flexible flat cable is only an example, however. The connecting device 6 may also take another form, for example that of a plug-in or screw connection.

Figure 7 shows a perspective view of a blank 60 for a module of an electrical
20 connection system 2 according to the invention. The outer dimensions of the blank 60 correspond to those of the previously illustrated modules. This blank 60 too is not provided with a cover, so as to allow a view into the inside 62 of the blank 60.

In the middle of its right-hand end wall 57, the blank 60 is provided with a connecting piece 19a. The connecting piece 19a is round and has a groove 20a in its

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circumference for accommodating an O-ring, not shown. A first opening 68a is formed in the connecting piece 19a and the end wall 57 located behind it, for guiding a conductor bar or a connector pin from the outside into the inside 62 of the blank 60. In the exemplary embodiment illustrated in Figure 7 the first opening 68a takes the form of a vertical slot. The first opening 68a may, however, also be constructed as a horizontal slot, square or round.

In the internal space 62 of the blank 60 an inner dividing wall 64 is provided at a distance from the right-hand end wall 57, for dividing off an area 66 of the internal space 62. This divided-off area 66 may be filled, for example with an insulating casting compound, to seal the internal space 62 against the penetration of dust, moisture and/or the like through the first opening 68a. A second opening 68b is provided in the dividing wall 64, for guiding a conductor or a conductor bar from the first opening 68a on into the internal space 62 of the blank 60.

In the left-hand end wall 56 of the internal space 62 a third opening 68c is provided, for guiding a conductor, an electrically conductive pin or a conductor bar from the internal space 62 through the left-hand end wall 56 to the outside.

The embodiment shown in Figure 7 is shown only by way of example, for instance a second dividing wall may be provided in the left-hand area of the internal space 62, in order there to form a second divided-off area 66 for accommodating an insulating casting compound, in order also to seal the third opening 68c.

Figure 8 shows a perspective view of a cooling module 34. The structure of the end walls 56, 57 of the cooling module 34 corresponds to the end walls 56, 57 of the sensor module 26 shown in Figure 4. The side walls 63 of the cooling module 34 are each provided on their inner and outer sides with cooling ribs 14. These cooling ribs 14 allow

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heat, which is generated by components, not shown, connected in the internal space 33 of the cooling module 34, to be effectively dissipated to the outside. A diode, a sensor and/or a conductor bar, for example, may be fitted in a cooling module 34.

In a further exemplary embodiment, not shown, the cooling ribs 14 are
5 constructed such that laterally adjacent cooling modules 34 are connectable together by inserting the cooling ribs 14 in one another, such that the cooling modules 34 are connectable together not only in the longitudinal direction, but also in the transverse direction. In particular, the cooling ribs 14 may be constructed for this purpose with a dovetailed profile. In a further exemplary embodiment which is not shown, cooling ribs
10 14 are formed on the top and/or bottom of the cooling module 34, such that the modules may be connected together mechanically in all three dimensions.

In an exemplary embodiment which is not shown, the modules are provided, irrespective of the cooling ribs 14, with connecting elements on the side walls and/or on the top or bottom, such that the modules may be connected together in two or three
15 dimensions.

Figure 9 shows a perspective view of two modules 24, 26, which are connected together by a latching connector 16, not visible in Figure 9. The two modules 24, 26 have each been closed in leakproof manner by a cover 65, such that the components fitted in the modules 24, 26 are protected, in accordance with a predetermined IP protection rating,
20 from external influences, such as for example moisture or dust. Further modules may be attached to the respective end walls 56, 57 via the projections 17 provided on the right-hand end wall 57 of the right-hand module 26 or the latching arms 16a provided on the left-hand end wall 56 of the diode module 24. An electrical connection to a further module, mounted on the right-hand end wall 57, is produced via the electrically

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conductive pin 18 in the right-hand end wall 57 of the right-hand module 26. The O-ring 20 mounted on the connecting piece 19b seals the connection in watertight manner. At the left-hand end wall 56 of the diode module 24 there is provided a connecting piece 19a, not visible, for accommodating a connecting piece 19b and an electrically conductive pin 5 18 of an adjacent module and so producing a further electrical connection.

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CLAIMS

1. A kit for an electrical connection system (2) for photovoltaic solar installations, comprising a plurality of solar cells each with its own electrical connection,

wherein the kit comprises a number of modules (22; 24; 26; 30; 31; 34), which
5 comprise a plurality of different types of modules (22; 24; 26; 30; 31; 34), in which in each case different components (6; 8; 9; 12) of the connection system(2) are accommodated,

wherein the kit comprises at least one type of module (22) which is constructed with a connecting device (6) for connection of the external electrical connection of one of
10 the solar cells; and

wherein a plurality of the modules (22; 24; 26; 30; 31; 34) may be connected together in a selectable manner.
2. A kit according to claim 1, wherein the connecting device (6) comprises a clamping device for clamping the electrical connection in place.
- 15 3. A kit according to any one of the preceding claims, wherein the kit comprises a type of module (24; 26) which is designed for connection of a component selected from the group comprising a diode (8), a temperature sensor and a theft sensor.
4. A kit according to any one of the preceding claims, wherein the kit comprises a type of module (24; 26) in which a component is connected which is selected from the
20 group comprising a diode (8), a temperature sensor and a theft sensor.
5. A kit according to any one of the preceding claims, wherein the kit comprises a type of module (26; 30; 31) which is provided with a connection selected from a group comprising a data connection and power connection (10; 11).

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6. A kit according to any one of the preceding claims, wherein the kit comprises a type of module (22; 24; 30; 31) which is provided with at least one conductor bar (12).
7. A kit according to any one of the preceding claims, wherein the kit comprises a type of module (34) which is provided with cooling ribs (14).
- 5 8. A kit according to any one of the preceding claims, wherein the kit comprises a type of module which is filled at least in part with a casting compound.
9. A kit according to claim 8, wherein the casting compound is a thermally conductive casting compound.
- 10 10. A kit according to one of the preceding claims, wherein the modules (22; 24; 26; 30; 31; 34) each comprise at least one latching connector (16) for connecting adjacent modules (22; 24; 26; 30; 31; 34) together mechanically.
11. A kit according to one of the preceding claims, wherein at least some of the types of modules (22; 24; 26; 30; 31; 34) in each case comprise at least one electrical connector (18) for connecting adjacent modules together electrically.
- 15 12. A kit according to claim 11, wherein at least some of the types of modules (24) in each case comprise at least one O-ring (20) for watertight sealing of the electrical connector.
13. A kit according to one of the preceding claims, wherein at least some of the types of modules (22; 24; 26; 30; 31; 34) may be closed in leakproof manner.
- 20 14. A kit according to one of the preceding claims, wherein the modules (22; 24; 26; 30; 31; 34) are produced at least in part using an injection moulding method.
15. A module (22; 24; 26; 30; 31; 34) constituting part of a kit comprising a plurality of modules (22; 24; 26; 30; 31; 34) for an electrical connection system (2) for

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photovoltaic solar installations, comprising a plurality of solar cells each with its own electrical connection,

wherein a selectable component (6; 8; 9; 12) of the connection system (2) is accommodated in the module and

5 the module (22; 24; 26; 30; 31; 34) may be connected to further modules (22; 24; 26; 30; 31; 34) of the kit.

16. A module according to claim 15, wherein the module (22) is provided with a connecting device (6) for connecting an electrical connection of a solar cell.

17. A module according to claim 16, wherein the connecting device (6) comprises a
10 clamping device for clamping the electrical connection in place.

18. A module according to claim 15, wherein the module (24; 26) may be provided with a component selected from the group comprising a diode (8), a temperature sensor and a theft sensor.

19. A module (24; 26) according to claim 15, wherein the module (24; 26) is provided
15 with a component selected from the group comprising a diode (8), a temperature sensor and a theft sensor.

20. A module according to any one of claims 15 - 19, wherein the module (26; 30; 31) may be provided with a connection selected from the group comprising a power connection (10; 11) and a data connection.

20 21. A module according to any one of claims 15 - 20, wherein the module (26; 30; 31) is constructed with a connection selected from the group comprising a power connection (10; 11) and a data connection.

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22. A module according to any one of claims 15 - 21, wherein the module (22; 24; 30; 31) is provided with at least one conductor bar (12).
23. A module according to any one of claims 15 - 22, wherein the module (34) is provided with cooling ribs (14).
- 5 24. A module according to any one of claims 15 - 23, wherein the module is filled at least in part with a casting compound.
25. A module according to claim 24, wherein the casting compound is a thermally conductive casting compound.
26. A module according to any one of claims 15 - 25, wherein the module (22; 24; 30; 31; 34) comprises at least one latching connector (16) for mechanical connection to at
10 least one further module (22; 24; 30; 31; 34).
27. A module according to any one of claims 15 - 26, wherein the module (22; 24; 30; 31; 34) comprises at least one electrical connector (18) for electrical connection to at least one further module (22; 24; 30; 31; 34).
- 15 28. A module according to claim 27, wherein the module (24) comprises at least one O-ring (20) for watertight sealing of the electrical connector.
29. A module according to any one of claims 15 - 28, wherein the module (22; 24; 26; 30; 31; 34) may be closed in watertight manner.
30. A module according to any one of claims 15 - 29, wherein the module (22; 24; 26; 30; 31; 34) is produced at least in part using an injection moulding method.
20

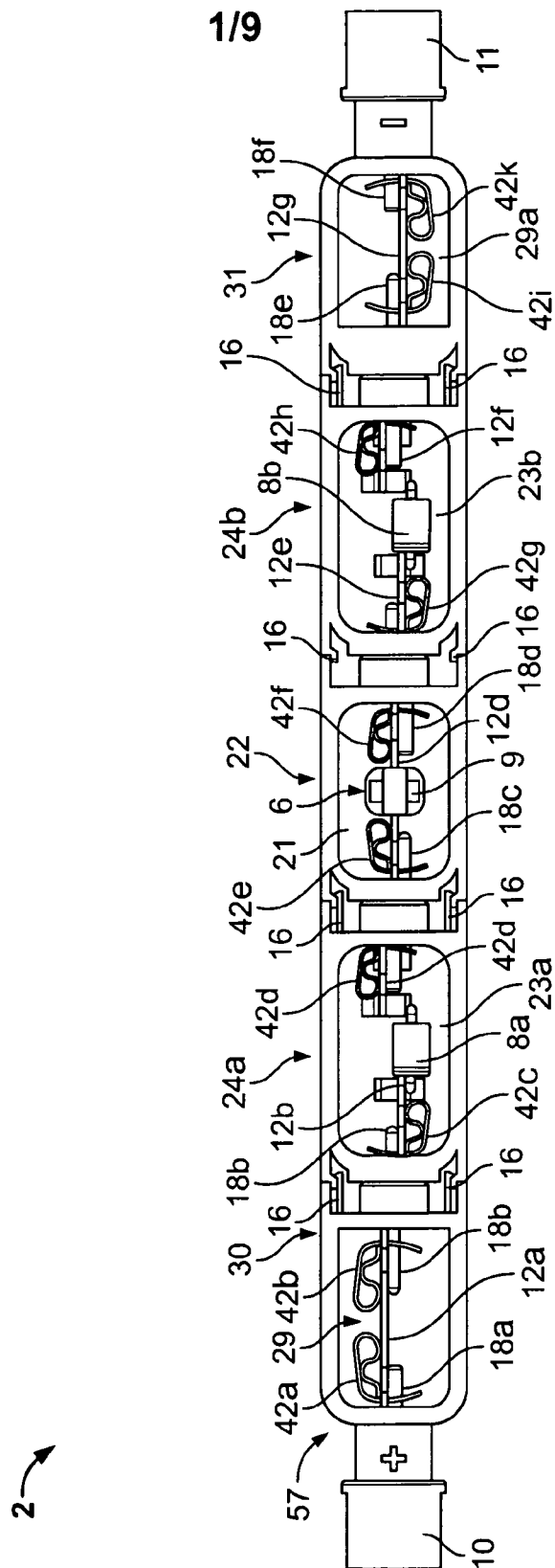


Fig. 1

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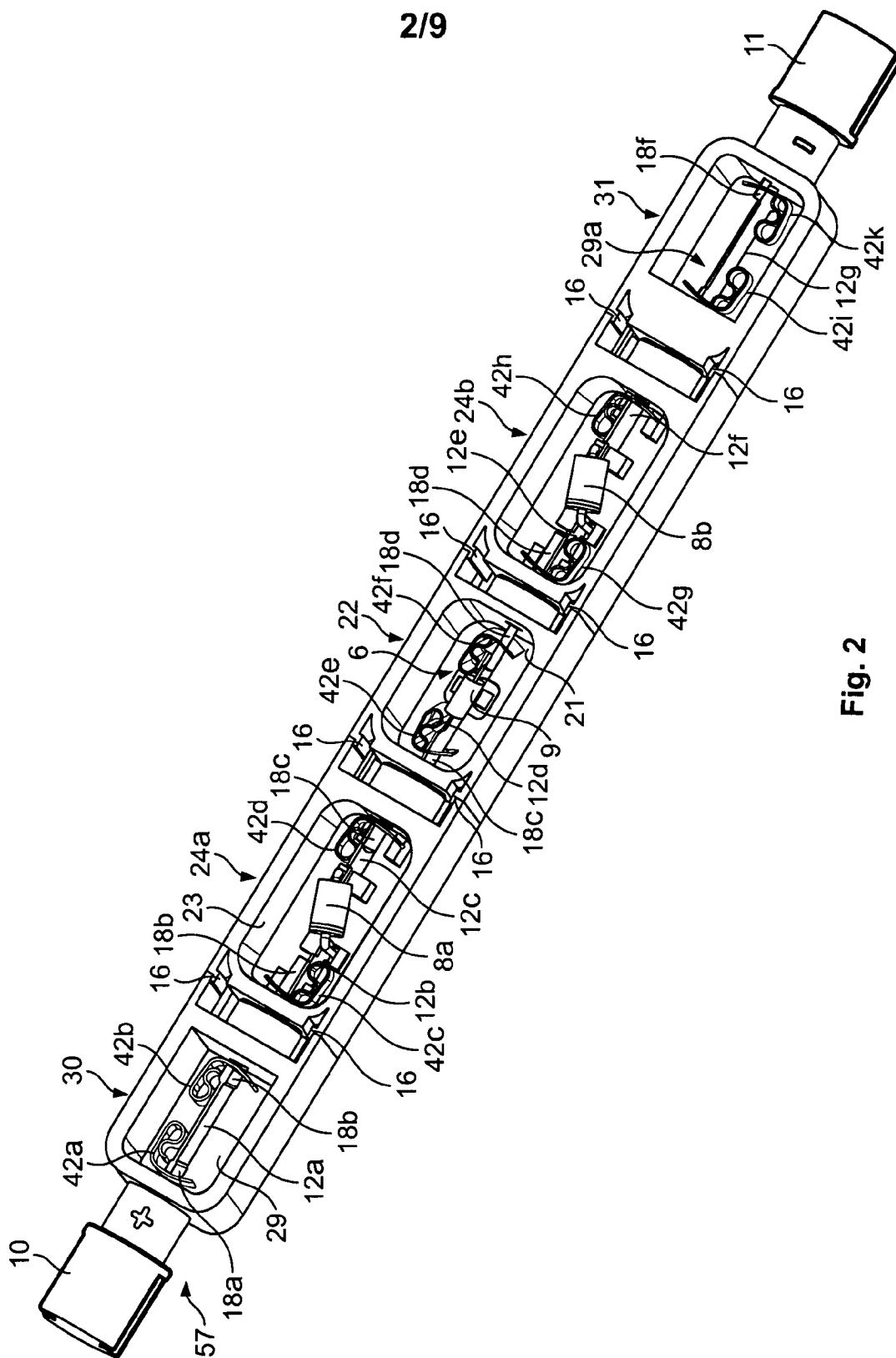


Fig. 2

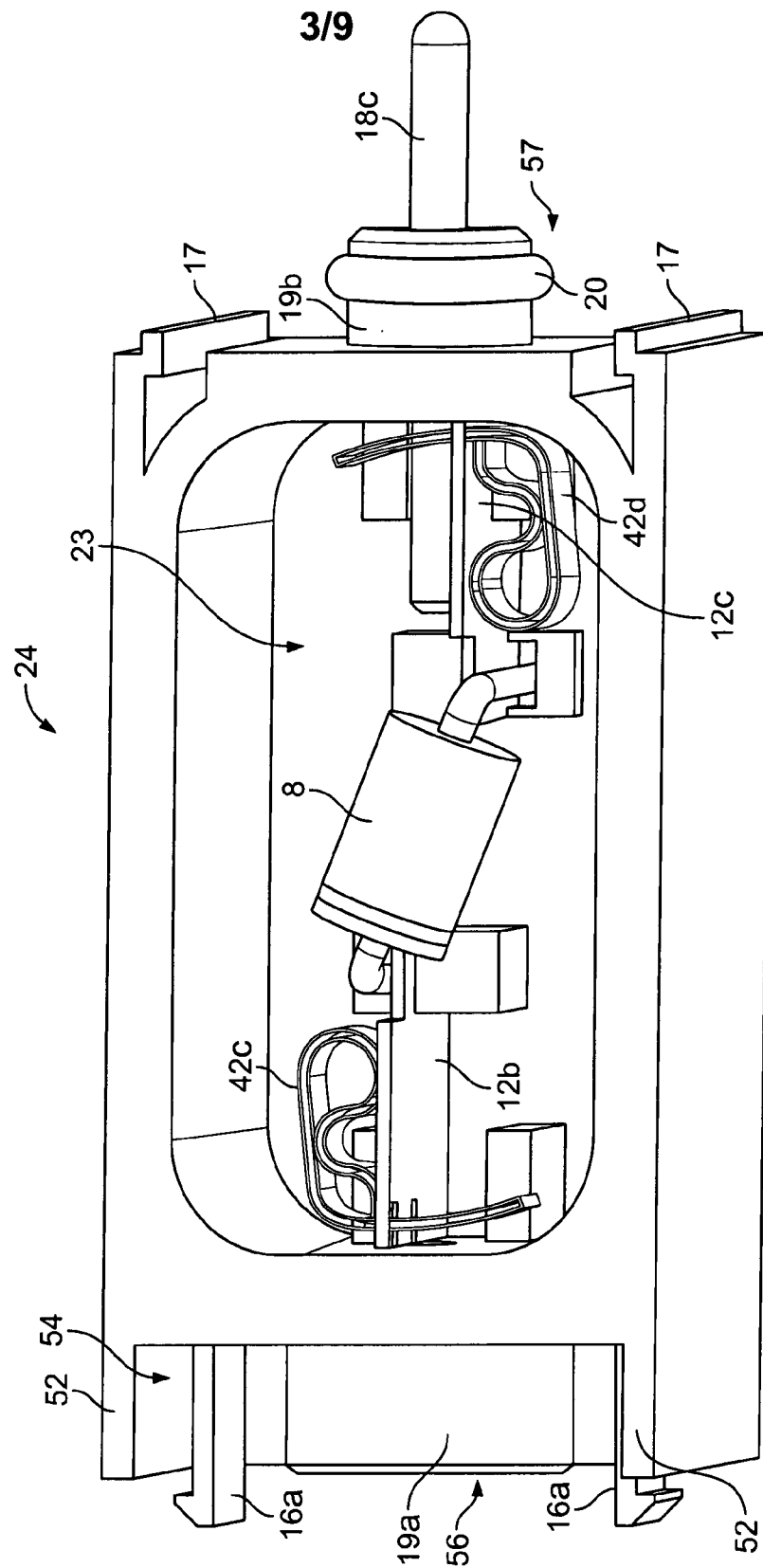


Fig. 3

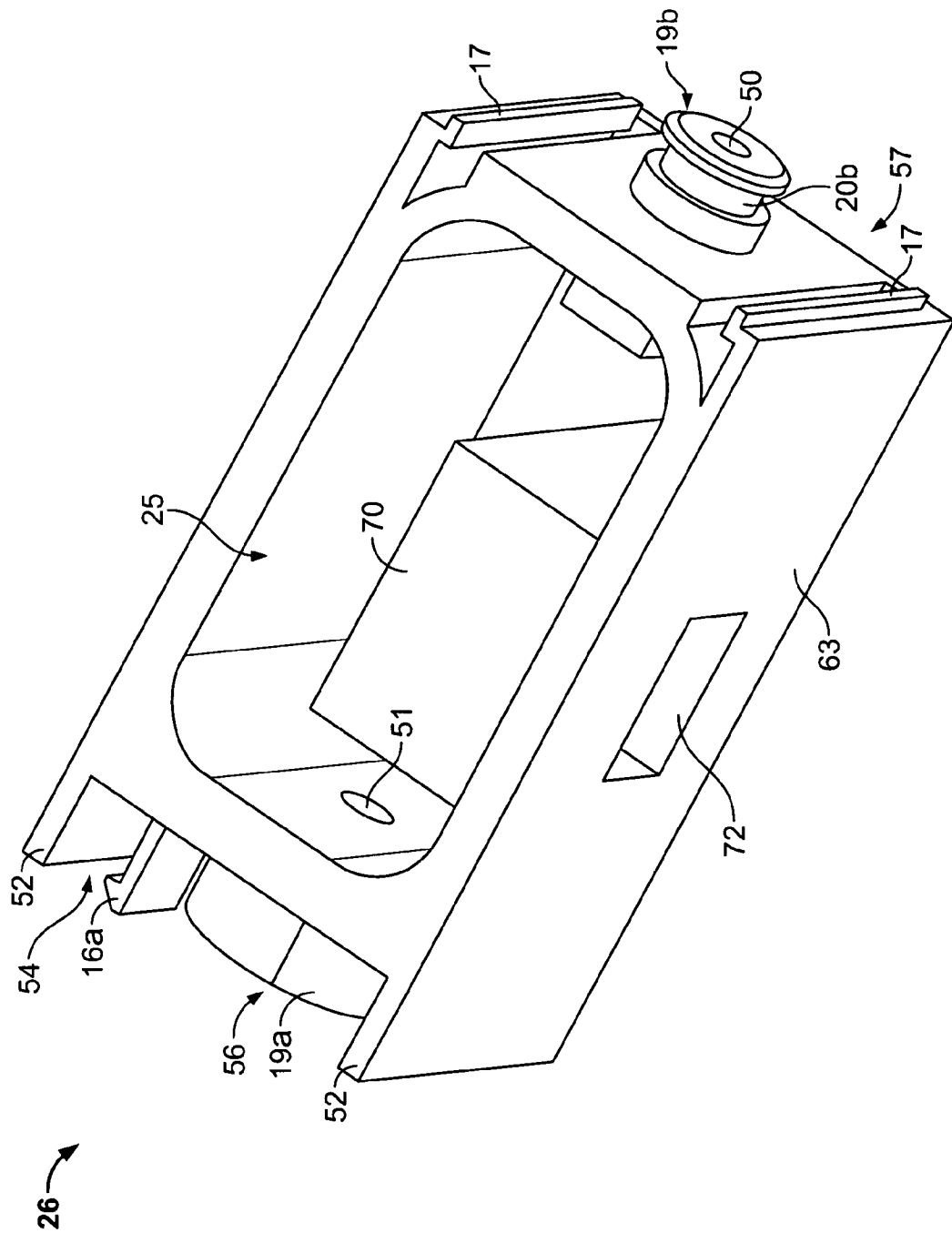


Fig. 4

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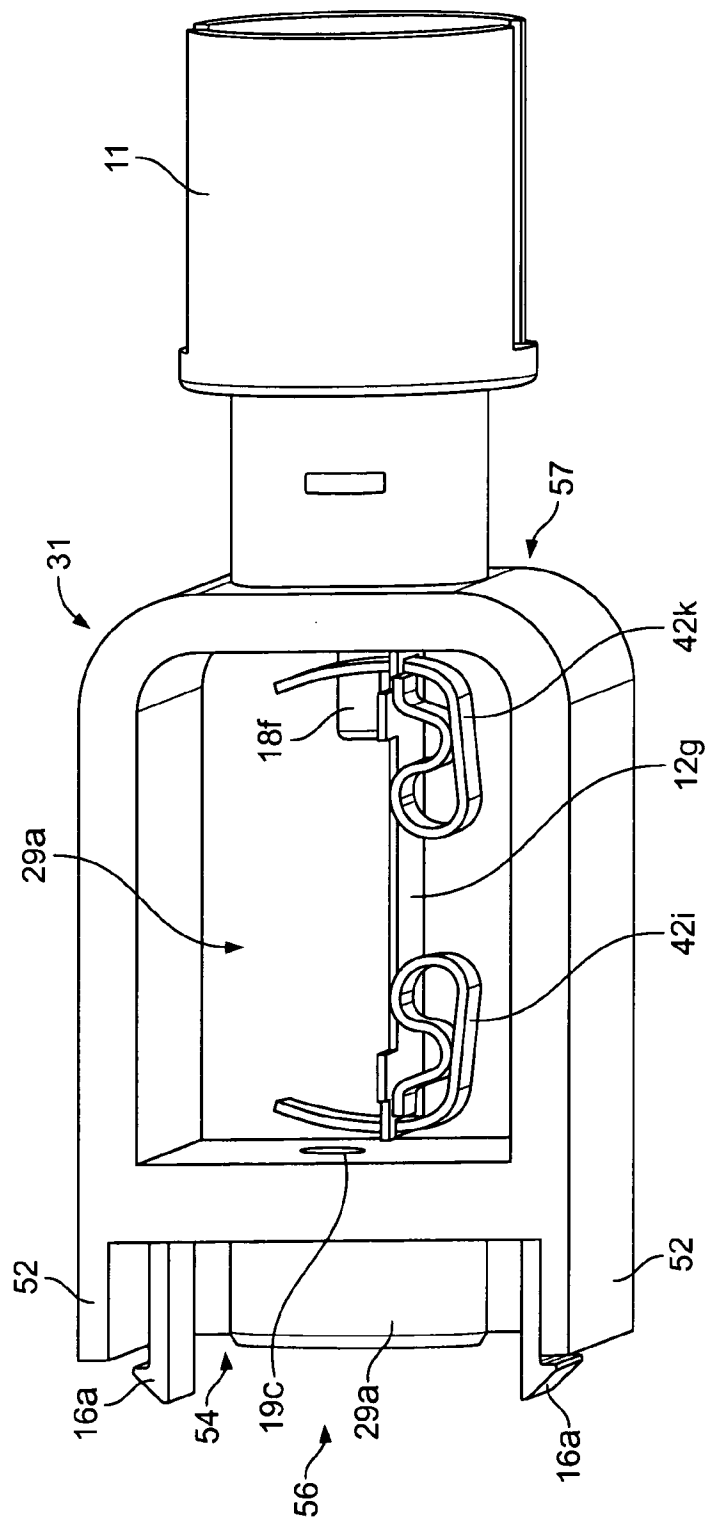


Fig. 5

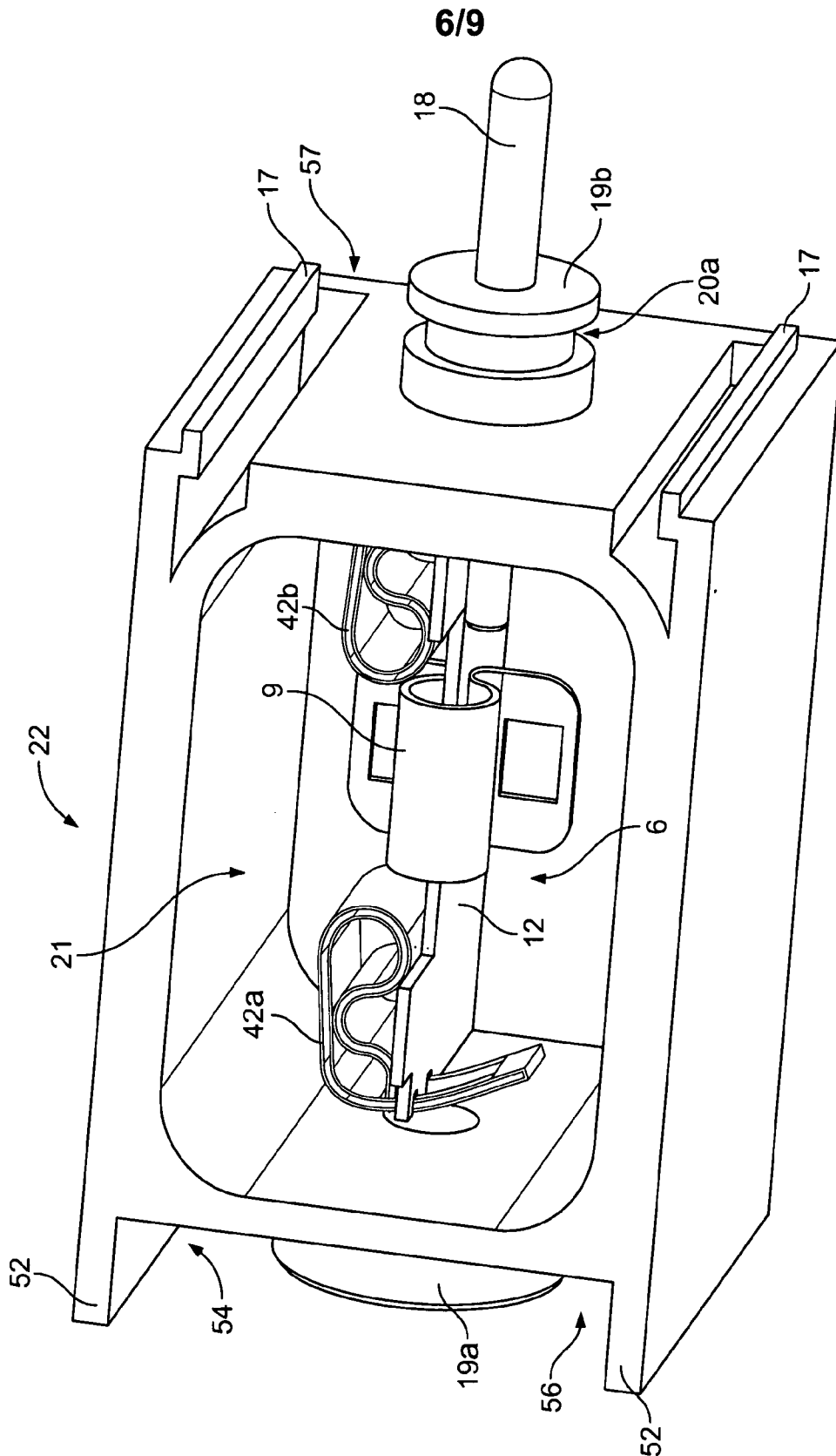


Fig. 6

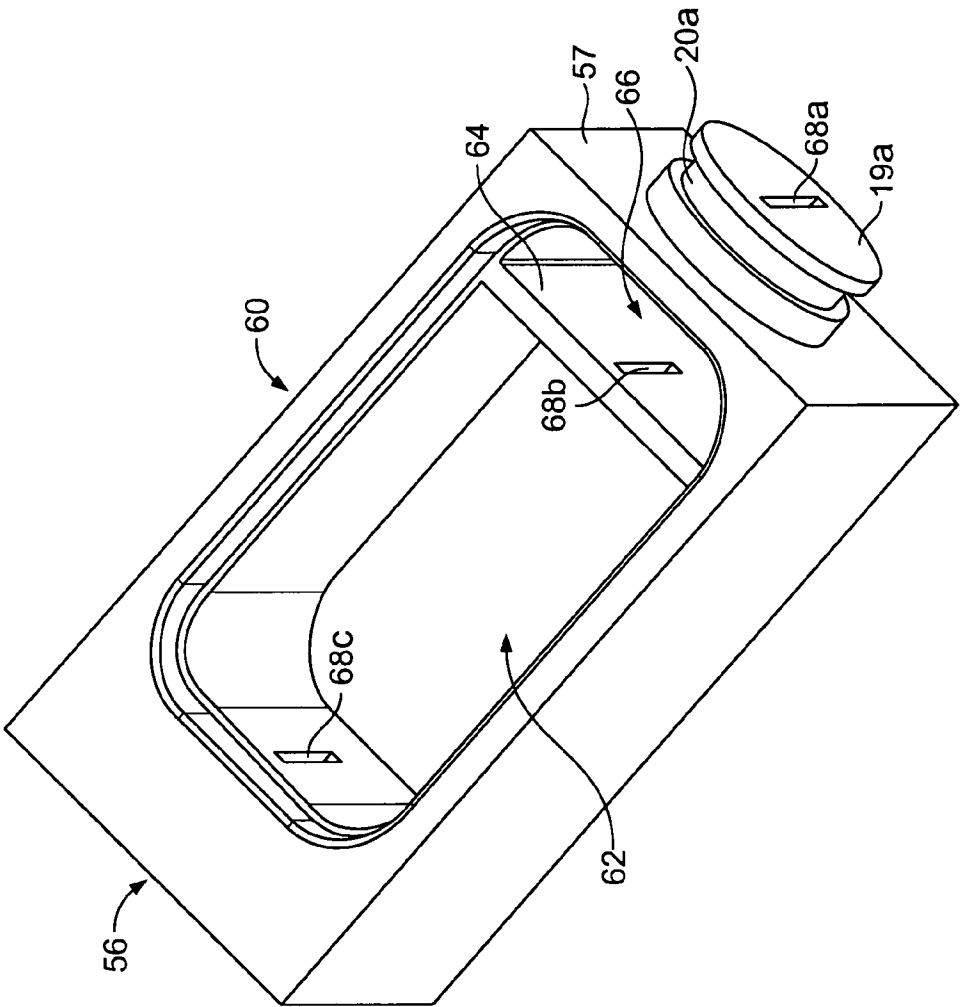


Fig. 7

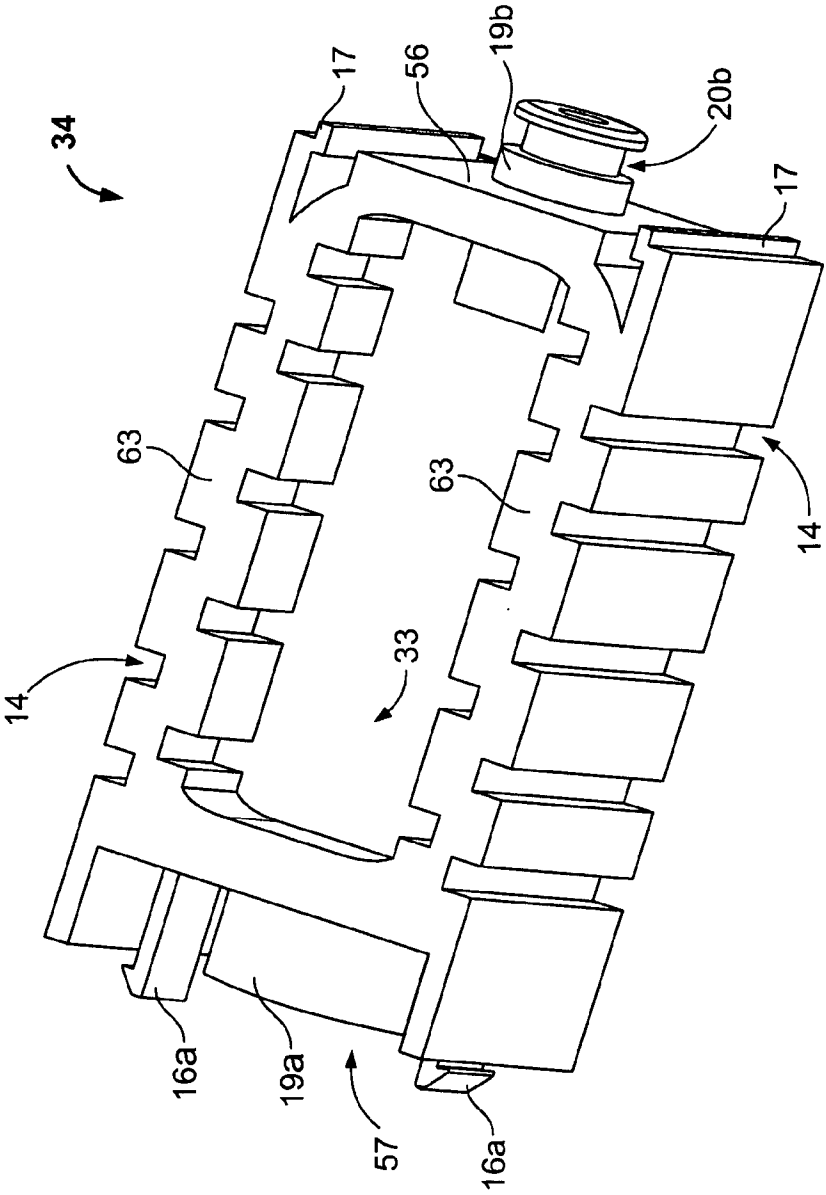


Fig. 8

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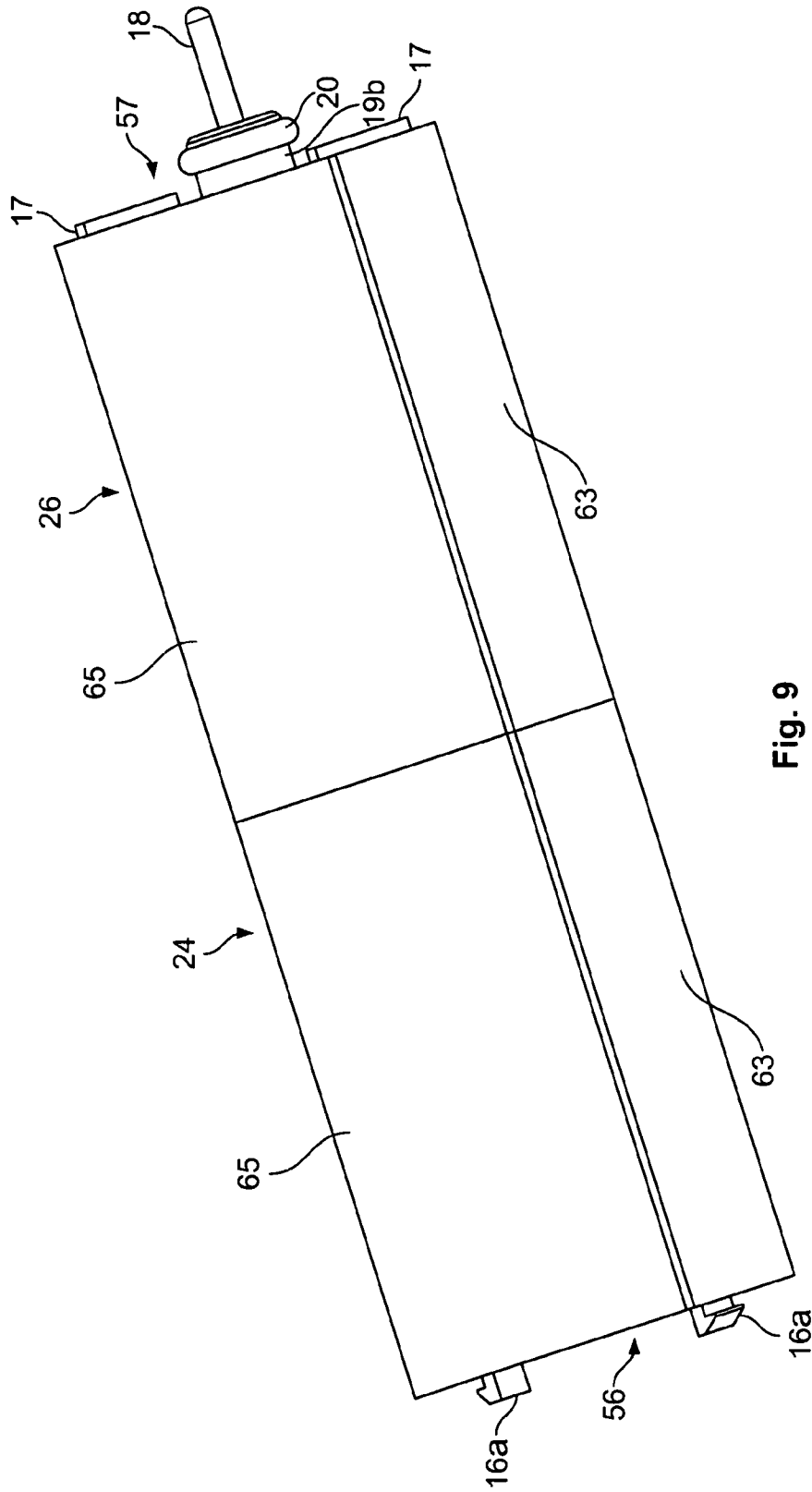


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/006379

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01R13/514 H01L31/048

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01R H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/070163 A1 (REDMOND FRANK E [US] REDMOND III FRANK E [US] ET AL) 31 March 2005 (2005-03-31)	1, 15
Y	paragraph [0010] - paragraph [0018]; figures 3, 4	2-4, 6-8, 10-14, 16-19, 22-24, 26-30
Y	EP 1 758 176 A (KITANI ELECTRIC CO LTD [JP]) 28 February 2007 (2007-02-28) paragraph [0024] - paragraph [0031] figures 1-8, 12	2-4, 6-8, 10-14, 16-19, 22-24, 26-30

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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* & * document member of the same patent family

Date of the actual completion of the international search

1 December 2008

Date of mailing of the international search report

09/12/2008

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Criqui, Jean-Jacques

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2008/006379

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2008/006379

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